Worked evidence example

A cylinder under axial compression: from matching experiments to an inspectable non-conservative neighbour.

Recorded application walkthrough, not a project verification report. App source version d3d3f358; captured locally with a Professional account. The experimental points are actual catalogue records, not illustrative data.

01 / Place the design

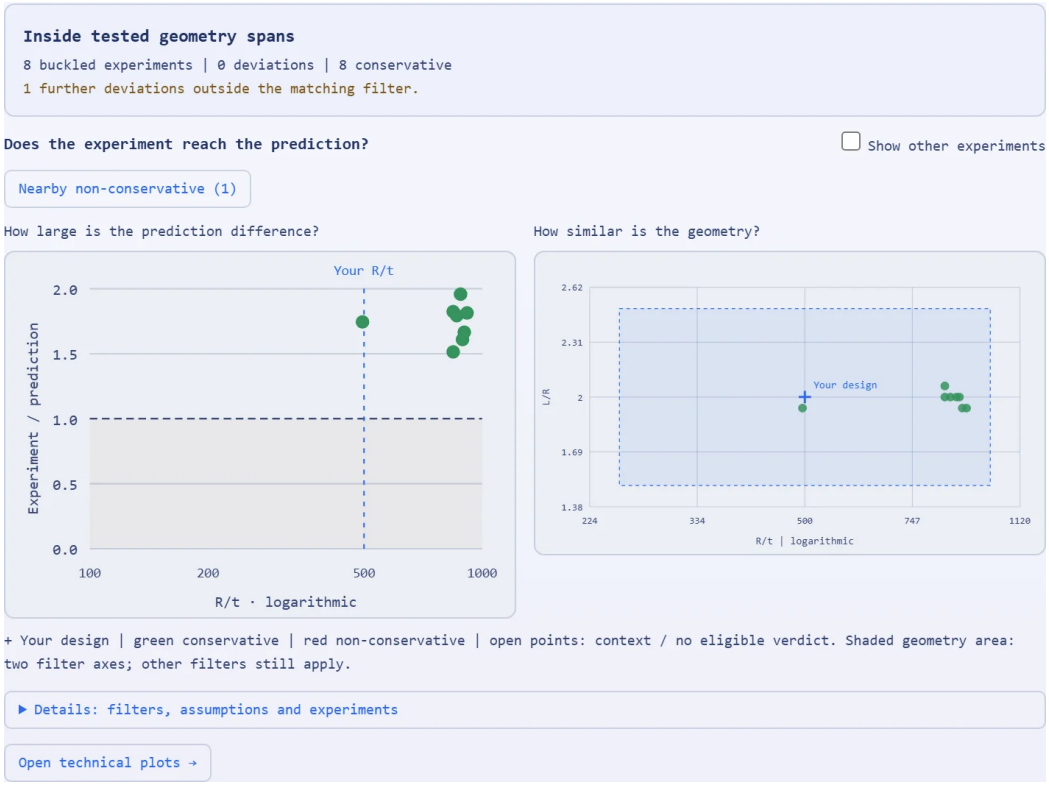
Input	Illustrative design
Geometry	R = 500 mm; t = 1 mm; L = 1,000 mm
Material inputs	E = 210,000 MPa; yield stress = 355 MPa; Poisson ratio = 0.30
Imperfection / method	Input w/t = 1.00; MDC, A-Basis; no fabrication filter initially
Dimensionless geometry	R/t = 500; L/R = 2; Batdorf Z = 1,907.88



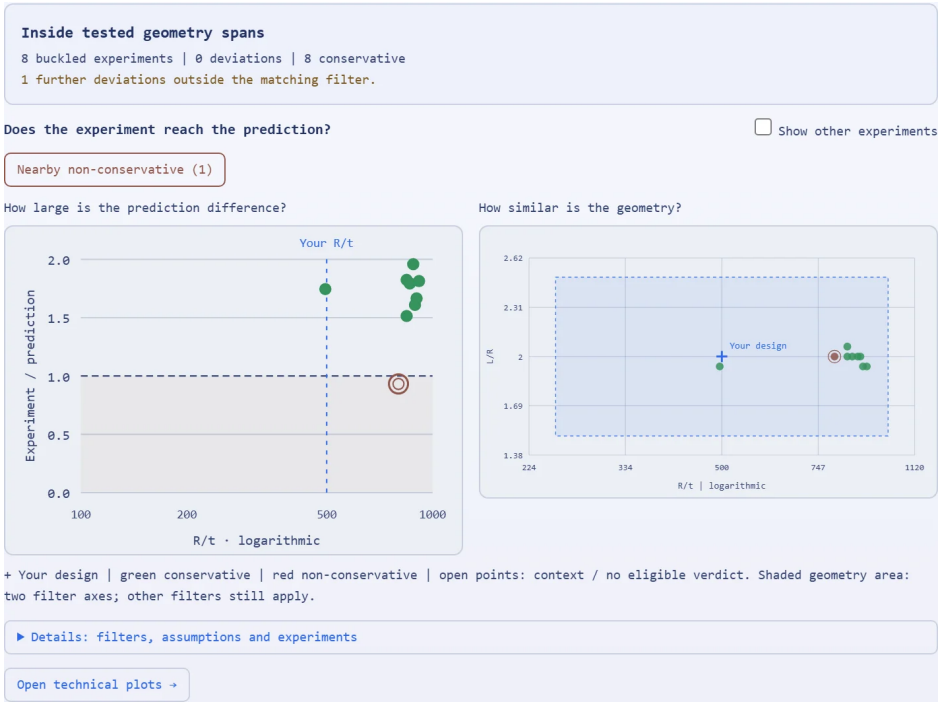
Ten matching buckled experiments: nine conservative, one non-conservative. ?Inside tested geometry spans? describes the displayed geometry check. It is not approval of every material, support or manufacturing condition.

02 / Filter fabrication without hiding the exception

Select machined fabrication. Eight matching buckled experiments remain and all eight are conservative. The app separately flags one further deviation outside that matching filter.



Enable ?Nearby non-conservative?. SST-2 appears as a red ring in the load-ratio plot and the geometry map. The eight matching machined experiments remain the same population.



The geometry map projects two filter axes. For this case the initial geometric neighbourhood uses R/t within a factor of two and L/R within +/-25%; the nearby-deviation view broadens the context across fabrication classes. These are browsing rules, not a proof of physical equivalence.

03 / Inspect the geometry and the measurement

Geometry of nearby non-conservative tests

Nearby means R/t within a factor 2 of your design, across fabrication classes. Only experiments eligible under the existing heritage rules are included. The wider band relaxes the other geometry and fabrication filters; it does not relax evidence eligibility. Percentages compare each ratio with your design. These additional tests do not change the matching-evidence counts.

Experiment / fabrication	R/t	L/R	Evidence / filter
Your design machined / precision	500.0	2.000	Reference for differences
SST-2 → welded wall Prediction above test	800.0 +60.0%	2.000 0.0%	Eligible for verdict Outside the tighter filter

Quantity	Your design	SST-2
Fabrication	Machined filter	Rolled plate, laser-welded; two longitudinal weld lines
R / t / L [mm]	500 / 1 / 1,000	400 / 0.5 / 800
R/t; L/R	500; 2.00	800; 2.00
w/t	1.00, entered input	3.31, measured geometric imperfection
E / yield [MPa]; nu	210,000 / 355; 0.30	193,000 / 215; 0.29; AISI 304
Collapse comparison	No project load verification in this walkthrough	Experiment 49.90 kN; stored MDC prediction 53.56 kN

Experiment / prediction = 0.931674 (displayed as 0.932); the stored prediction exceeds the experiment by approximately 7.3%. These are the specimen's stored comparison values, using its own measured geometry and material, not a prediction for the illustrative design.

The record states an empirical MDC P01 quantile with smoothing, elastic KDF and plasticity correction. This is not a MIL-HDBK tolerance bound. The A-Basis selection of the design does not convert every experimental verdict into a confidence guarantee.

Measurement provenance in the app: inner-surface 3D laser scan, Panasonic HL-G1, best-fit cylinder, maximum out-of-roundness from the Fig. 2 colour scale: 1.656 mm, w/t = 3.31. The record flags weld-line and residual-stress effects as a modelling limitation.

Source: Kalnins et al. (2015), *Experimental Nondestructive Test for Estimation of Buckling Load on Unstiffened Cylindrical Shells Using Vibration Correlation Technique*, Shock and Vibration, article 729684. doi:10.1155/2015/729684. Values here are transcribed from the documented app record; consult the primary source for test details.

04 / Transfer ratios, then review the remaining physics

A 600 mm cylinder and a 5,000 mm cylinder can have identical geometric ratios. This is a scaling illustration, not a claim that these two shells were tested.

Quantity	Smaller shell	Larger shell
Diameter [mm]	600	5,000
Wall thickness [mm]	0.6	5.0
Length [mm]	600	5,000
Imperfection amplitude w [mm]	0.6	5.0
R/t; L/R; w/t	500; 2; 1	500; 2; 1
Z, with nu = 0.30	1,907.88	1,907.88

For this cylinder, Z = L squared / (R times t) times sqrt(1 minus nu squared). It stays constant when all lengths, including the imperfection amplitude, scale together.

Before using a comparison, review the load case and load introduction, support conditions, material response and yield effects, fabrication route, imperfection shape and amplitude, thickness variation and the stated method limits. Matching ratios alone do not establish that those conditions match.

Decision View verdicts require eligible tests with measured imperfection data. Torispherical heads under internal pressure use their model’s separately stated evidence basis. Context records and lower bounds do not count as conservative verdicts. An empty eligible population is an evidence gap.

Your own experiments

A useful comparison starts with measured geometry and imperfections, fabrication and support information, material data and measured collapse load. Contact Skalnav to agree a comparison and secure data exchange. This walkthrough does not promise a self-service test-upload workflow.

Explore the example online / Discuss your own tests